California Regional Water Quality Control Board
North Coast Region

ORDER NO. R1-2004-0052
WDID NO. 1B04028RSON

WASTE DISCHARGE REQUIREMENTS

FOR

IN-SITU TREATMENT OF VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER BY ENHANCED REDUCTIVE DECHLORINATION

ARNOLD CARSTON
LARRY CARILLO
RICHARD CLAYTON

Former Golden Technology Site
3017, 3019, and 3033 Santa Rosa Avenue
Santa Rosa, California
Sonoma County

The California Regional Water Quality Control Board, North Coast Region (hereinafter the Regional Water Board), finds that:

1. On March 12, 2004, PES Environmental Engineering and Environmental Services Inc. submitted a Report of Waste Discharge on behalf of Responsible Parties Arnold Carston, Larry Carillo, and Richard Clayton[1]. The Report of Waste Discharge proposes the subsurface injection of Hydrogen Releasing Compounds (HRC®) at the former Golden Technology Inc. manufacturing facility to enhance the biodegradation of volatile organic compounds (VOCs) in groundwater at the properties located at 3017, 3019, and 3033 Santa Rosa Avenue, in Santa Rosa California (hereinafter the Site). As the applicants proposing the discharges regulated by this Order, Arnold Carston, Larry Carillo, and Richard Clayton are hereinafter referred to as the Dischargers.

2. Golden Technology Inc. (Golden Technology) operated a printed circuit board manufacturing facility at 3017 Santa Rosa Avenue in Santa Rosa, California from approximately 1969 to 1975. All business activities by Golden Technology ceased at the Site following the fire at the facility on April 21, 1975 and the company went out of business. Waste management units at the Site were subsequently removed or abandoned.

[1] Although listed on the Report of Waste Discharge, Pacific Indemnity Company, holder of an insurance policy for former Golden Technology Inc., is not named as a discharger in this Order.

Additional regulatory investigations and enforcement actions at the Site were suspended until 1988 when the industrial solvent trichloroethylene (TCE) was discovered in water supply wells south of the Site.

3. Golden Technology used acids, metals, and solvents in its manufacturing operations. Wastes generated from operations at the Golden Technology facility between 1972 and 1975 were discharged to the parcels located at 3017, 3019, and 3033 Santa Rosa Avenue in Santa Rosa, California. The property at 3017 Santa Rosa Avenue is owned by the SR Land Company (Arnold Carston and Larry Carillo). The property at 3019 Santa Rosa Avenue is owned by Richard Clayton. The property at 3033 Santa Rosa Avenue is owned by Richard Clayton. A Site location map is presented as **Exhibit A**.

4. On December 5, 1972, the Regional Water Board issued Cleanup and Abatement Order No. 72-90 requiring Golden Technology to cease discharging waste into the surface drainage ditch at the facility.

5. Samples collected by Regional Water Board staff between 1988 and 1995 documented the presence of TCE in groundwater and in soil gas down-gradient of the Site.

6. In November 1993, the Regional Water Board issued Cleanup and Abatement Order No. 93-112 requiring Golden Technology and other previously named dischargers to conduct work to define the extent of contamination in soil and in groundwater, to conduct a survey to identify and sample nearby water-supply wells, and to prepare a time schedule for completing investigative and interim remedial actions at the Site.

7. On December 13, 1995, the Regional Water Board agreed to hold Order No. 93-112 in abeyance to the extent necessary to ensure acceptance and continued eligibility of the Site in the California Expedited Remedial Action Reform Act Program, which is administered by the California Department of Toxic Substances Control (DTSC).

8. On March 20, 1997, the Dischargers entered into an Enforceable Agreement with the DTSC, requiring the Dischargers to "…implement site investigation, remedial action, removal action and public participation plans, engineering designs, final response actions, operation and maintenance requirements and other DTSC-approved plans, if applicable, as well as complying with any additional laws and regulations that may be required (such as California Environmental Quality Act)…" to meet Site cleanup objectives.

9. The Site consists of approximately 3 acres spanning three parcels located within an area of mixed commercial and residential development in southern Santa Rosa. The Site is bounded by Sunset Mobile Home Park to the north; the World of Carpets and Stor-N-Loc businesses to the south; a commercial building at 3011 Santa Rosa Avenue and Santa Rosa Avenue to the east, and by U.S. Highway 101 to the west.

10. The Site is located in the central Santa Rosa Plain groundwater subbasin. The Site is underlain by imported sandy gravel fill material to a depth of approximately 1 to 3 feet below ground surface, followed by a three to 6 foot layer of clay. These strata are underlain by interbedded sands, gravels, silts and clays to a depth of at least 100 feet below ground surface, the maximum depth explored at the Site.

11. Two significant water-bearing zones are present beneath the Site. The upper water-bearing zone is present from approximately 7 feet below ground surface (bgs) to approximately 30 feet bgs. A lower water-bearing zone is present from approximately 65 feet bgs to 100 feet bgs. Groundwater beneath the Site flows in a southerly direction.

12. VOCs detected in groundwater at the Site include the following chemicals: tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2-dichloroethne (DCE), trans-1,2-dichloroethene, 1,2-dichloroethane, benzene, ethylbenzene, and isopropylbenzene. The concentrations of VOCs exceed the water quality objectives for these chemicals, and impair the beneficial uses of groundwater. A Site map showing the locations of VOCs detected in groundwater at the Site in March 2003 is presented as **Exhibit B.**

13. The Dischargers propose to evaluate the effectiveness of the groundwater treatment technology known as enhanced reductive dechlorination. Enhanced reductive dechlorination involves the injection of degradable carbonaceous materials to provide a food source for subsurface microorganisms that also utilize chlorinated compounds in the process of respiration. Microbial degradation of the injected carbonaceous materials produces an oxygen-depleted environment in which chlorinated alkenes such as PCE, TCE, and DCE are destroyed. During this process chlorine atoms are sequentially replaced by hydrogen atoms in the chemical reaction known as reductive dechlorination. The resulting chemical products include ethene, ethane, chloride ion, carbon dioxide, methane, and water. Maximum Contaminant Levels in drinking water have not been established for these compounds.

14. Previous investigations at the Site have identified compounds in groundwater that indicate reductive dechlorination of VOCs is occurring to a limited extent under natural ambient conditions. However, the process appears to be limited by slightly oxidative conditions in groundwater at the Site. To shift the subsurface conditions to a reductive chemical state, the Dischargers propose to inject Hydrogen Releasing Compound (HRC®), a commercially available product that contains a polylactate ester that is released into groundwater slowly over time to provide a source of food for subsurface microbes. Polylactate is a mixture of organic and inorganic salts of lactic acid.

15. The release of polylactate in groundwater generates the following chemicals: lactic acid, pyruvic acid and acetic acid. Maximum Contaminant Levels in drinking water have not been established for these compounds. A taste and odor threshold for acetic acid in drinking water has been identified at 97,000 parts per billion.

16. The proposed treatability study includes a contingency plan for the injection of specific microbial cultures selected for their ability to carry the dechlorination process to completion if post-injection groundwater monitoring indicates that this biological augmentation is needed.

17. The Dischargers propose to use direct-push drilling methods to advance a perforated injection tool to a target depth of approximately 30 feet below ground surface. Prior to injection, the HRC® will be heated to a temperature range from 80 to 100 degrees Fahrenheit. The product will then be injected, at a rate of 6 lb. per vertical foot, into the

aquifer from the bottom up as the injection tool is withdrawn from the boring. Approximately 14 injection points into shallow groundwater are proposed for the treatability study. The area of the proposed chemical and microbial injections is approximately 30 feet by 50 feet. More than one round of injections may be necessary to provide a sufficient food source to complete the dechlorination process. A Site map showing the locations of the proposed injection points and the network of groundwater monitoring wells is presented as **Exhibit C.**

18. The Dischargers have indicated that the remedial process may temporarily mobilize dissolved iron in the injection area. The treatability study may also create a temporary increase in the concentration of vinyl chloride and other metals potentially affected by the reductive chemical environment in the injection area. If an upward trend in the concentrations of metals, vinyl chloride or hydrogen sulfide occurs in downgradient monitoring wells, a contingency monitoring program will be implemented. If the site monitoring data indicate likelihood that mobilized metals, vinyl chloride or other adverse water quality conditions created by the discharge may migrate beyond the boundaries of the property owned or controlled by the dischargers, a contingency plan to add an oxygen source to groundwater will be implemented. The contingency plan consists of injecting a solution containing oxygen-releasing compounds into groundwater downgradient of the treatment area. The injection of these chemicals would change conditions in groundwater to an oxidative environment, preventing migration of metals and vinyl chloride beyond the area proposed for treatment. The proposed injection of chemicals is consistent with the antidegradation provisions of State Water Resources Control Board Resolution No. 68-16. The short-term effect on water quality would be insignificant and the long-term effect would be beneficial.

19. Post-injection remedial effectiveness monitoring will consist of sampling groundwater monitoring wells in the upper water-bearing zone within and downgradient from the area of chemical injection. Remedial effectiveness monitoring will be conducted quarterly for a period of at least one year after the final chemical injection. Groundwater samples will be analyzed for the following constituents: VOCs; total organic carbon; iron; manganese; arsenic; chloride; nitrate; sulfate; alkalinity; chemical oxygen demand; oxidation-reduction potential; pH; and the dissolved gases, oxygen, methane, ethane, and ethene. The remedial effectiveness monitoring well network will consist of monitoring wells MW-UA-01, PZ-UA-01, MW-UA-02, MW-2 and MW-5. The down-gradient property on which monitoring wells MW-2 and MW-5 are located is owned by Arnold Carston.

20. The Regional Water Board's Water Quality Control Plan for the North Coast Region includes water quality objectives and receiving water limitations to ensure the beneficial uses of water. Several beneficial uses of water exist, and the most stringent objective for protection of all beneficial uses is selected as protective for water quality. A listing of the water quality objectives for waters of the State impacted by discharges from the Site is presented as **Exhibit D** of this Order.

21. Surface water in the central Santa Rosa Plain flows to the Russian River. The beneficial uses of the Russian River and its tributaries include:

    a. municipal and domestic supply
    b. agricultural supply
    c. industrial service supply
    d. groundwater recharge
    e. navigation
    f. hydropower generation
    g. water contact recreation
    h. noncontact water recreation
    i. commercial and sport fishing
    j. warm freshwater habitat
    k. cold freshwater habitat
    l. wildlife habitat
    m. preservation of areas of special biological significance
    n. preservation of rare and endangered species
    o. migration of aquatic organisms
    p. spawning reproduction, and/or early development

22. Beneficial uses of groundwater include: municipal, domestic, industrial process and service supply, and agricultural water supply as identified in the Water Quality Control Plan for the North Coast Region.

23. The sources of drinking water for the nearby businesses and residents in the area near the Site include both groundwater and the City of Santa Rosa's municipal water system.

24. The permitted discharge is a minor cleanup action costing less than $1 million taken to prevent, minimize, stabilize, mitigate, or eliminate the release of hazardous waste or substance and is therefore exempt from the California Environmental Quality Act (Public Resources Code Section 21000 et seq.) pursuant to Title 14, California Code of Regulations, Section 15330.

25. The Regional Water Board has notified the Dischargers and interested agencies and persons of its intent to prescribe waste discharge requirements for the discharge and has provided them with an opportunity to submit written comments and recommendations.

26. The Regional Water Board, at a public meeting, heard and considered all comments pertaining to the discharge.

THEREFORE, IT IS HEREBY ORDERED that the Dischargers, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following:

A. DISCHARGE PROHIBITIONS

1. The discharge of any waste not specifically regulated by this Order is prohibited.

2. Creation of pollution, contamination, or nuisance, as defined by Section 13050 of the California Water Code (CWC) is prohibited. [Health and Safety Code, Section 5411]

3. The discharge of treatment additives to land, surface waters or to groundwater in areas other than approved for remedial action by this Order is prohibited

4. The migration of any metal mobilized by the treatment process or vinyl chloride or other byproducts produced as part of the process is prohibited beyond the boundaries of the property owned or controlled by the Dischargers.

5. The discharge of treatment additives to property not owned or controlled by the Dischargers is prohibited.

B. DISCHARGE SPECIFICATIONS

1. The proposed injection of Hydrogen Releasing Compounds (HRC®) shall not impart taste, odor, or color to, or otherwise degrade the beneficial uses of areal groundwater, except for temporary taste and odor changes within the proposed treatment area as shown in Exhibit C.

2. The injection of HRC® shall not impart taste, odor, or color to or otherwise degrade the beneficial uses of areal groundwater beyond the boundaries of the property owned or controlled by the Dischargers.

3. The methods for injection of HRC® in the proposed areas shall be conducted as described in the Work Plan for Upper Aquifer Zone Treatability Study dated October 29, 2003, the Work Plan Addendum for Upper Aquifer Zone Treatability Study dated February 26, 2004, and in the Report of Waste Discharge submitted on March 12, 2004.

4. The injection of HRC® shall not produce airborne hydrogen sulfide concentrations which exceed 0.03 parts per million by volume (ppmv) at the boundaries of the property owned or controlled by the Dischargers.

C. PROVISIONS

1. A copy of this Order shall be maintained at the discharge facility and be available at all times to operating personnel.

2. Severability
Provisions of these waste discharge requirements are severable. If any provision of these requirements is found invalid, the remainder of these requirements shall not be affected.

3. Operation and Maintenance
The Dischargers must maintain in good working order and operate as efficiently as possible any facility or control system installed by the Dischargers to achieve compliance with the waste discharge requirements.

4. Change in Discharge
The Dischargers must promptly report to the Regional Water Board any material change in the character, location, or volume of the discharge.

5. Change in Ownership
In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the Dischargers, the Dischargers must notify the succeeding owner or operator in advance of the transfer of ownership or control, of the following items by letter, a copy of which must be forwarded to the Regional Water Board:

a. existence of this Order, and
b. the status of the Dischargers' annual fee account.

6. Vested Rights
This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, nor protect the discharger from his liability under federal, state, or local laws, nor create a vested right for the discharger to continue the waste discharge.

7. Monitoring
The discharger must comply with the Contingency Planning and Notification Requirements Order No. 74-151 and the Monitoring and Reporting Program No. R1-2004-0052, and any modifications to these documents as specified by the Executive Officer. Such documents are attached to this Order and incorporated herein. Chemical and bacteriological analyses must be conducted at a laboratory certified for such analysis by the State Department of Health Services.

8. Inspections
The Dischargers shall permit authorized staff of the Regional Water Board:

a. entry upon premises in which an effluent source is located or in which any required records are kept;
b. access to copy any records required to be kept under terms and conditions of this Order;
c. inspection of monitoring equipment or records; and
d. sampling of any discharge.

9. Noncompliance
In the event any or all of the Dischargers is unable to comply with any of the conditions of this Order due to:

a. breakdown of waste treatment equipment;
b. accidents caused by human error or negligence; or
c. other causes such as acts of nature;

the Dischargers must notify the Executive Officer by telephone as soon as they or their agents have knowledge of the incident and confirm this notification in writing within two weeks of the telephone notification. The written notification shall include pertinent information explaining reasons for the noncompliance and shall indicate the steps taken to correct the problem and the dates thereof, and the steps being taken to prevent the problem from recurring.

10. Revision of Requirements
This Regional Water Board requires the discharger to file a report of waste discharge at least 120 days before making any material change or proposed change in the character, location or volume of the discharge.

11. Expiration
These waste discharge requirements expire 36 months after issuance and no further recision action is necessary.

12. Any person affected by this action of the Regional Water Board may petition the State Water Resources Control Board (State Water Board) to review the action in accordance with Section 13320 of the California Water Code and Title 23, California Code of Regulations, Section 2050. The petition must be received by the State Water Board within 30 days of the date of this Order. Copies of the law and regulations applicable to filing petitions will be provided upon request. In addition to filing a petition with the State Water Board, any person affected by this Order may request the Regional Water Board to reconsider this Order. Such request should be made within 30 days of the date of this Order. Note that even if reconsideration by the Regional Water Board is sought, filing a petition with the State Water Board within the 30-day period is necessary to preserve the petitioner's legal rights. If you choose to appeal the Order, be advised that you must comply with the Order while your appeal is being considered.

Certification

I, Catherine E. Kuhlman, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, North Coast Region, on August 25, 2004.

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Catherine E. Kuhlman
Executive Officer